AF

PATENT
Atty Docket No. KLAC0076

I HEREBY CERTIFY THAT ON JUNE 25, 2007, THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO: MAIL STOP APPEAL BRIEF – PATENTS, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450.

STEVEN W. SMYRSKI

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Group Art Unit: 2872
DAVID R. SHAFER, ET AL.	Examiner: Joshua L. Pritchett
Title: CATADIOPTRIC IMAGING SYSTEM FOR BROAD BAND MICROSCOPY	
Serial No.: 10/646,073	
Filed: August 22, 2003	

APPELLANTS' BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from the final rejection of the Examiner dated January 26, 2007 in the above-referenced application.

1. Real Party in Interest

The real party in interest is KLA-Tencor Technologies Corporation, a corporation of California, USA, and an assignment of the application to KLA-Tencor Technologies Corporation is recorded at the United States Patent and Trademark Office at Reel 014909, Frame 0508.

2. Related Appeals and Interferences

There are no related appeals or interferences known to the Appellants.

3. Status of the Claims

Claims 43-99 stand finally rejected and are subject of this appeal. A complete listing of the claims as pending is reproduced in the Appendix.

The final rejection of claims 43-99 is the subject of this appeal.

4. Status of Amendments

No amendments were filed after the final rejection.

5. Summary of Claimed Subject Matter

The present invention is directed to objectives, and particularly objectives used in microscopy applications. From the specification, small objectives are desirable, as small objectives can be used in combination with standard microscope objectives and physically fit within standard microscope turrets. [Specification, p. 7, ll. 16-19] However, using a shorter working distance in such an objective can result in a reduced objective diameter at the cost of increasing central obscuration, significantly degrading objective performance. [Specification, p. 7, l. 19 – p. 8, l. 5] An objective having low intrinsic aberrations is desirable, as is an objective that is largely self-corrected for both monochromatic and chromatic aberrations, as a self corrected objective will have looser alignment tolerances with other self corrected imaging optics. [Specification, p. 8, ll. 6-13] Further, reducing

incidence angles on lens surfaces can have a large effect on optical coating performance and manufacturing. In general, lower angles of incidence on lens surfaces also produce looser manufacturing tolerances. [Specification, p. 8, ll. 13-17]

The present design in general presents a catadioptric objective corrected over a wavelength range from 266-1000nm using a single glass material, or in certain circumstances, more than one glass material to improve performance. [Specification, p. 14, ll. 2-19] The objective may provide particular benefits in the microscopy field. One aspect of the objective design is optimized for broad-band imaging in the UV and visible spectral region, namely approximately 0.266 to 1.000 micron wavelengths. [*Id.*] The objective provides relatively high numerical apertures and large object fields. [*Id.*] The design uses the Schupmann principle in combination with an Offner field lens to correct for axial color and first order lateral color. [*Id.*] The design in certain embodiments employs an immersion substance, and all embodiments shown align elements along a single axis. Lenses and other elements presented in the design are less than approximately 100 millimeters in diameter.

Regarding individual claims, independent claim 43 recites:

An objective for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range, comprising:

at least one focusing lens having diameter less than approximately 100 millimeters receiving said light energy and transmitting focused light energy;

at least one field lens having diameter less than approximately 100 millimeters, receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy and providing controlled light energy through an immersion substance to a specimen;

wherein each focusing lens and each field lens is formed from a single glass material and aligned substantially along an axis, and further wherein said Mangin mirror

element, said at least one focusing lens, and said at least one field lens are configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens, and said at least one field lens.

In this regard, examples in the specification are disclosed from page 14 to page 45 and at FIG. 3 to FIG. 12. The exemplary embodiments disclose an objective [FIGs. 3-5, 7, 9-12; Specification, p. 14, ll. 2-6; p. 14, ll. 1-9; p. 26, ll. 10-17; p. 30, ll. 1-11; p. 33, ll. 15-18; p. 35, ll. 1-9; p. 36, ll. 1-8; p. 48, ll. 1-11] for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range [Specification, p. 17, l. 18 – p. 18, l. 10; p. 41, ll. 7-11], comprising at least one focusing lens [FIG. 3; 311; 301-304; Specification, p. 15, ll. 8-10; p. 16, ll. 17-19; see also, FIG. 4; 412, 401-405; FIG. 5; 513; 501-506; FIG. 7; 713; 701-706; FIG. 9; 916; 901-907; FIG. 10; 1016; 1005-1012; FIG. 11; 1114; 1107-1112; FIG. 12; 1211; 1201-1204; and related text] having diameter less than approximately 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8] receiving said light energy and transmitting focused light energy, at least one field lens [FIG. 3; 305; Specification, p. 14, ll. 4-7; see also, FIG. 4; 406; FIG. 5; 507; FIG. 7; 707; 701-706; FIG. 9; 917; 908-910; FIG. 10; 1015; 1003-1004; FIG. 11; 1106; FIG. 12; 1205; and related text] having diameter less than approximately 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8] receiving said focused light energy and transmitting intermediate light energy; and at least one Mangin mirror element [FIG. 3; 312; 306-307; Specification, p. 17, ll. 2 – 9; see also, FIG. 4; 413; 407-408; FIG. 5; 514; 508-509; FIG. 7; 714; 708-709; FIG. 9; 918; 911-912; FIG. 10; 1014; 1002; FIG. 11; 1113; 1102-1105; FIG. 12; 1212; 1206-1207; and related text] having diameter less than 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8] receiving said intermediate light energy and providing controlled light energy through an immersion substance [FIGs. 8-11; Specification, p. 13, ll. 4-15; p. 32, ll. 2-17; p. 33, ll. 1-

22] to a specimen, wherein each focusing lens and each field lens is formed from a single glass material [Specification, p. 21, ll. 19-26; Tables 1-3, 7, and 8, listing "FUSED SILICA" as the lens materials] and aligned substantially along an axis [FIGs. 3-5; 7; 9-12 (unmarked lines going down the center of each objective)], and further wherein said Mangin mirror element, said at least one focusing lens, and said at least one field lens are configured to balance aberrations therebetween [Specification, p. 19, ll. 20-26; p. 20, ll. 12-23; p. 33, ll. 8-10], said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens, and said at least one field lens [Specification, p. 20, l. 10 – p. 21, l. 5; p. 21, l. 6 – p. 22, l. 2].

Claim 55 recites:

An objective comprising:

at least one focusing lens having diameter less than approximately 100 millimeters receiving said light energy and transmitting focused light energy;

at least one field lens having diameter less than approximately 100 millimeters, receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy through said Mangin mirror element and providing controlled light energy through an immersion substance to a specimen;

wherein said objective is configured to provide broadband imaging while receiving light energy at wavelengths less than 400 nm and further wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis and configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens and said at least one field lens.

In this regard, examples in the specification are disclosed from page 14 to page 45 and at FIG. 3 to FIG. 12. The exemplary embodiments disclose an objective [FIGs. 3-5,

7, 9-12; Specification, p. 14, ll. 2-6; p. 14, ll. 1-9; p. 26, ll. 10-17; p. 30, ll. 1-11; p. 33, ll. 15-18; p. 35, ll. 1-9; p. 36, ll. 1-8; p. 48, ll. 1-11] comprising at least one focusing lens [FIG. 3; 311; 301-304; Specification, p. 15, ll. 8-10; p. 16, ll. 17-19; see also, FIG. 4; 412, 401-405; FIG. 5; 513; 501-506; FIG. 7; 713; 701-706; FIG. 9; 916; 901-907; FIG. 10; 1016; 1005-1012; FIG. 11; 1114; 1107-1112; FIG. 12; 1211; 1201-1204; and related text] having diameter less than approximately 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8] receiving said light energy and transmitting focused light energy, at least one field lens [FIG. 3; 305; Specification, p. 14, ll. 4-7; see also, FIG. 4; 406; FIG. 5; 507; FIG. 7; 707; 701-706; FIG. 9; 917; 908-910; FIG. 10; 1015; 1003-1004; FIG. 11; 1106; FIG. 12; 1205; and related text] having diameter less than approximately 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8], receiving said focused light energy and transmitting intermediate light energy; and at least one Mangin mirror element [FIG. 3; 312; 306-307; Specification, p. 17, ll. 2 – 9; see also, FIG. 4; 413; 407-408; FIG. 5; 514; 508-509; FIG. 7; 714; 708-709; FIG. 9; 918; 911-912; FIG. 10; 1014; 1002; FIG. 11; 1113; 1102-1105; FIG. 12; 1212; 1206-1207; and related text] having diameter less than 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8] receiving said intermediate light energy through said Mangin mirror element and providing controlled light energy through an immersion substance [FIGs. 8-11; Specification, p. 13, ll. 4-15; p. 32, ll. 2-17; p. 33, ll. 1-22] to a specimen; wherein said objective is configured to provide broadband imaging while receiving light energy at wavelengths less than 400 nm [Specification, p. 3, l. 14 – p. 4, l. 3; p. 29, ll. 12-20] and further wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis [FIGs. 3-5; 7; 9-12 (unmarked lines going down the center of each objective)] and configured to balance aberrations therebetween [Specification, p. 19, ll. 20-26; p. 20, ll. 12-23; p. 33, ll. 8-10], said aberration balancing reducing decenter sensitivity of the

Mangin mirror element, said at least one focusing lens and said at least one field lens [Specification, p. 20, l. 10 – p. 21, l. 5; p. 21, l. 6 – p. 22, l. 2].

Claim 65 recites:

A method for inspecting a specimen, comprising:

providing light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range;

focusing said light energy using at least one lens into focused light energy, where each lens used in said focusing has diameter less than approximately 100 millimeters;

receiving said focused light energy and converting said focused light energy into intermediate light energy; and

receiving said intermediate light energy through an optical element and providing controlled light energy from the optical element and through an immersion substance to a specimen;

wherein said optical element is configured to operate with said focusing light energy and receiving focused light energy to balance aberrations resulting from the focusing, receiving focused light energy, converting, receiving intermediate light energy, and providing controlled light energy.

In this regard, examples in the specification are disclosed from page 14 to page 45 and at FIG. 3 to FIG. 12. The exemplary embodiments disclose a method for inspecting a specimen, comprising providing light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range [Specification, p. 17, l. 18 – p. 18, l. 10; p. 41, ll. 7-11]; focusing said light energy using at least one lens [FIG. 3; 311; 301-304; Specification, p. 15, ll. 8-10; p. 16, ll. 17-19; see also, FIG. 4; 412, 401-405; FIG. 5; 513; 501-506; FIG. 7; 713; 701-706; FIG. 9; 916; 901-907; FIG. 10; 1016; 1005-1012; FIG. 11; 1114; 1107-1112; FIG. 12; 1211; 1201-1204; and related text] into focused light energy, where each lens used in said focusing has diameter less than

approximately 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8]; receiving said focused light energy and converting said focused light energy into intermediate light energy [FIG. 3; 305; Specification, p. 14, ll. 4-7; see also, FIG. 4; 406; FIG. 5; 507; FIG. 7; 707; 701-706; FIG. 9; 917; 908-910; FIG. 10; 1015; 1003-1004; FIG. 11; 1106; FIG. 12; 1205; and related text]; and receiving said intermediate light energy through an optical element [FIG. 3; 312; 306-307; Specification, p. 17, ll. 2 – 9; see also, FIG. 4; 413; 407-408; FIG. 5; 514; 508-509; FIG. 7; 714; 708-709; FIG. 9; 918; 911-912; FIG. 10; 1014; 1002; FIG. 11; 1113; 1102-1105; FIG. 12; 1212; 1206-1207; and related text] and providing controlled light energy from the optical element and through an immersion substance [FIGs. 8-11; Specification, p. 13, ll. 4-15; p. 32, ll. 2-17; p. 33, ll. 1-22] to a specimen, wherein said optical element is configured to operate with said focusing light energy and receiving focused light energy to balance aberrations resulting from the focusing, receiving focused light energy, converting, receiving intermediate light energy, and providing controlled light energy [Specification, p. 19, ll. 20-26; p. 20, ll. 12-23; p. 33, ll. 8-10].

Claim 78 recites:

An objective for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range, comprising:

at least one focusing lens receiving said light energy and transmitting focused light energy;

at least one field lens receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy and providing controlled light energy through an immersion substance to a specimen;

wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis and configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens and said at least one field lens.

In this regard, examples in the specification are disclosed from page 14 to page 45 and at FIG. 3 to FIG. 12. The exemplary embodiments disclose an objective [FIGs. 3-5, 7, 9-12; Specification, p. 14, ll. 2-6; p. 14, ll. 1-9; p. 26, ll. 10-17; p. 30, ll. 1-11; p. 33, ll. 15-18; p. 35, ll. 1-9; p. 36, ll. 1-8; p. 48, ll. 1-11] for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range [Specification, p. 17, l. 18 – p. 18, l. 10; p. 41, ll. 7-11], comprising at least one focusing lens [FIG. 3; 311; 301-304; Specification, p. 15, ll. 8-10; p. 16, ll. 17-19; see also, FIG. 4; 412, 401-405; FIG. 5; 513; 501-506; FIG. 7; 713; 701-706; FIG. 9; 916; 901-907; FIG. 10; 1016; 1005-1012; FIG. 11; 1114; 1107-1112; FIG. 12; 1211; 1201-1204; and related text] receiving said light energy and transmitting focused light energy, at least one field lens [FIG. 3; 305; Specification, p. 14, ll. 4-7; see also, FIG. 4; 406; FIG. 5; 507; FIG. 7; 707; 701-706; FIG. 9; 917; 908-910; FIG. 10; 1015; 1003-1004; FIG. 11; 1106; FIG. 12; 1205; and related text] receiving said focused light energy and transmitting intermediate light energy, and at least one Mangin mirror element [FIG. 3; 312; 306-307; Specification, p. 17, ll. 2 – 9; see also, FIG. 4; 413; 407-408; FIG. 5; 514; 508-509; FIG. 7; 714; 708-709; FIG. 9; 918; 911-912; FIG. 10; 1014; 1002; FIG. 11; 1113; 1102-1105; FIG. 12; 1212; 1206-1207; and related text] having diameter less than 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8] receiving said intermediate light energy and providing controlled light energy through an immersion substance [FIGs. 8-11; Specification, p. 13, ll. 4-15; p. 32, ll. 2-17; p. 33, ll. 1-22] to a specimen, wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis [FIGs. 3-5; 7; 9-12 (unmarked lines going down the center of each objective)] and configured to balance aberrations therebetween [Specification, p. 19, ll. 20-26; p. 20, ll. 12-23; p. 33, ll. 8-10], said aberration balancing reducing decenter sensitivity of the Mangin mirror

element, said at least one focusing lens and said at least one field lens [Specification, p. 20, l. 10 – p. 21, l. 5; p. 21, l. 6 – p. 22, l. 2].

Claim 90 recites:

An objective for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range, comprising:

at least one focusing lens receiving said light energy and transmitting focused light energy;

at least one field lens receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy and providing controlled light energy through an immersion substance to a specimen;

wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis and configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens and said at least one field lens.

In this regard, examples in the specification are disclosed from page 14 to page 45 and at FIG. 3 to FIG. 12. The exemplary embodiments disclose an objective [FIGs. 3-5, 7, 9-12; Specification, p. 14, ll. 2-6; p. 14, ll. 1-9; p. 26, ll. 10-17; p. 30, ll. 1-11; p. 33, ll. 15-18; p. 35, ll. 1-9; p. 36, ll. 1-8; p. 48, ll. 1-11] for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range [Specification, p. 17, l. 18 – p. 18, l. 10; p. 41, ll. 7-11], comprising at least one focusing lens [FIG. 3; 311; 301-304; Specification, p. 15, ll. 8-10; p. 16, ll. 17-19; see also, FIG. 4; 412, 401-405; FIG. 5; 513; 501-506; FIG. 7; 713; 701-706; FIG. 9; 916; 901-907; FIG. 10; 1016; 1005-1012; FIG. 11; 1114; 1107-1112; FIG. 12; 1211; 1201-1204; and related text] receiving said light energy and transmitting focused light energy;

at least one field lens [FIG. 3; 305; Specification, p. 14, ll. 4-7; see also, FIG. 4; 406; FIG. 5; 507; FIG. 7; 707; 701-706; FIG. 9; 917; 908-910; FIG. 10; 1015; 1003-1004; FIG. 11; 1106; FIG. 12; 1205; and related text] receiving said focused light energy and transmitting intermediate light energy; and at least one Mangin mirror element [FIG. 3; 312; 306-307; Specification, p. 17, ll. 2 – 9; see also, FIG. 4; 413; 407-408; FIG. 5; 514; 508-509; FIG. 7; 714; 708-709; FIG. 9; 918; 911-912; FIG. 10; 1014; 1002; FIG. 11; 1113; 1102-1105; FIG. 12; 1212; 1206-1207; and related text] having diameter less than 100 millimeters [Specification, p. 9, ll. 14-16; p. 9, l. 21 – p. 10, l. 5; p. 10, ll. 10-22; p. 10, l. 26 – p. 11, l. 7; p. 18, ll. 11-14; diameters listed in right columns of Tables 1-8] receiving said intermediate light energy and providing controlled light energy through an immersion substance [FIGs. 8-11; Specification, p. 13, ll. 4-15; p. 32, ll. 2-17; p. 33, ll. 1-22] to a specimen, wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis [FIGs. 3-5; 7; 9-12 (unmarked lines going down the center of each objective)] and configured to balance aberrations therebetween [Specification, p. 19, ll. 20-26; p. 20, ll. 12-23; p. 33, ll. 8-10], said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens and said at least one field lens [Specification, p. 20, l. 10 – p. 21, l. 5; p. 21, l. 6 – p. 22, l. 2].

6. <u>Grounds of Rejection to be Reviewed on Appeal</u>

Rejection of claims 43-51, 53-74, 76-86, and 88-99 under 35 U.S.C. §103(a) as being unpatentable over Shafer, U.S. Patent Publication 2001/0040722 ("Shafer 722") in view of Yonekubo, U.S. Patent 4,108,794 ("Yonekubo"); and rejection of dependent claims 52, 75, and 87 under 35 U.S.C. §103(a) as being unpatentable over Shafer 722 in view of Yonekubo and further in view of Deutsch, WO 01/57563 A2 ("Deutsch").

7. Argument

Preliminarily, Appellants note that a fundamental argument being made in the present case is that one can simply employ certain elements, such as an immersion substance, with previously available objective designs and obtain a functional design having the performance parameters claimed. This is like saying that an immersion substance used with existing eyeglasses would produce eyeglasses having improved performance parameters, when in fact it would produce blurry visual characteristics. In reality, certain design elements cannot be wholesale incorporated into existing designs and produce a workable completed design, such as an objective having improved performance characteristics over previously available objectives. Further, as discussed in detail below, certain claim elements are not shown by the references presented.

Claims 43-51, 53-74, 76-86, and 88-99 are Patentable Over Shafer in View of Yonekubo; Claims 52, 75, and 87 are Patentable Over Shafer and Yonekubo in View of Deutsch

Shafer 722 is a broad band DUV/VUV catadioptric imaging system using an off-axis implementation that corrects primary, secondary, and higher order lateral color, and chromatic variations of aberrations such as spherical, coma, and astigmatism. Shafer 722, paragraph [0039]. The sole mention of "decentering" or "decenter" is in paragraph [0096], which states in pertinent part:

> ...The arrangement of FIG. 7 also allows for improved design performance and relaxes manufacturing tolerances. *For example, the decentering of any lens element by 5 microns will cause less than one quarter wave of coma without using any compensation elements. Using element decenters and tilts as compensation elements, the tolerances become even more relaxed.* The arrangement of FIG. 7 includes one bend with some lenses after the second internal image. These lenses have extremely relaxed tolerances and tend not to affect the manufacturability of the

> system. The arrangement of FIG. 7 also has an external pupil plane 701 for aperturing and Fourier filtering. This pupil plane is in the collimated region so it corresponds to the Fourier plane of the object. The object in the arrangement of FIG. 7 extends from 0.25 mm to 0.75 mm off axis and the design has a bandwidth of 1 nm from 192.8-193.8 nm. ...

(emphasis added).

This passage discusses decentering generally, but the Shafer 722 design does not (1) have alignment substantially along a single axis, nor (2) have a construction configured **to balance aberrations between elements**, where aberration balancing reduces decenter sensitivity of the elements of the design.

The paragraph [0096] passage of Shafer 722 states that decentering of any lens element in the design by 5 millimeters causes less than a quarter wave of coma, and use of element decenters and tilts can relax tolerances. This does not speak to a configuration to balance aberrations between elements, where being configured to balance aberrations reduces decenter sensitivity. This design aspect is articulated in the present specification at, for example, the passage at p. 20, ll. 16-23:

> Using the present design, it is possible to reduce the decenter sensitivity of the lens and mirror elements by carefully balancing the aberrations within the catadioptric group 312 and focusing lens group 311. Total aberrations of the catadioptric group may be optimized using the design of FIG. 3 to balance the compensation required by the field lens group 305 and focusing lens group 311.

Such balancing of aberrations between, for example, catadioptric/Mangin elements and field lenses or focusing lenses is not shown by Shafer 722. These aspects of all the independent claims, as amended, including the axial alignment of elements and the elements being configured to balance aberrations to reduce decenter sensitivity, are

missing from Shafer 722. Further, Yonekubo does not disclose nor suggest these aspects of the design. Yonekubo shows an immersion substance used in connection with microscopes. For these reasons, namely the absence of elements configured to balance aberrations to reduce decenter sensitivity and the fact that the Shafer 722 design does not have elements aligned along a single axis, the present claims are allowable.

Regarding individual claims, Claim 43 recites "wherein each focusing lens and each field lens is formed from a single glass material and *aligned substantially along an axis*, and further wherein said Mangin mirror element, said at least one focusing lens, and said at least one field lens are *configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens, and said at least one field lens...*"

Claim 55 recites "wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are *substantially aligned along a single axis* and *configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity* of the Mangin mirror element, said at least one focusing lens and said at least one field lens..."

Claim 65 requires "wherein said optical element is *configured to operate with said focusing light energy and receiving focused light energy to balance aberrations* resulting from the focusing, receiving focused light energy, converting, receiving intermediate light energy, and providing controlled light energy..." Thus while claim 65 does not include the "alignment along a single axis" attribute, the presence of the "balancing aberrations" language serves to distinguish from the cited references.

Claim 78 recites "wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are *substantially aligned along a single axis* and *configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity* of the Mangin mirror element, said at least one focusing lens and said at least one field lens..."

Finally, claim 90 requires "wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are *substantially aligned along a single axis* and *configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity* of the Mangin mirror element, said at least one focusing lens and said at least one field lens..."

Thus each independent claim includes either "alignment along a single axis" of elements such as a Mangin mirror element, focusing lens(es), and field lens(es), configuring the objective elements to "balance aberrations," and/or aberration balancing reducing decenter sensitivity, aspects missing from the cited references.

Appellants note that the January 26 Office Action does not respond to these arguments or specific limitations, but argues previously included limitations. See, e.g., Office Action, p. 3 ("a single lens/mirror element comprising substantially curved concave surface...and a second minimally curved surface..."). The Office Action does not specifically address "alignment along a single axis" nor "balancing aberrations" or reducing decenter sensitivity. The Office Action instead rejects previously submitted and since canceled claim elements, and argues that combining the references in the manner suggested is justified. This ignores the "alignment along a single axis," "balancing aberrations," and "reducing decenter sensitivity" limitations, which is improper. For this reason alone, Appellants submit that independent claims 43, 55, 65, 78, and 90 are not obvious in view of the cited references.

Combining References

Further, Appellants dispute the contention that the present design is obvious in view of Shafer 722 in combination with Yonekubo. For this Appellants point to two aspects claimed: alignment of elements along a single axis and inclusion of an immersion substance with an existing objective. Briefly, one cannot simply take elements from an existing objective having multiple axis alignment, straighten them out, and obtain any type of reasonable performance. The Shafer 722 design, for example, includes certain curved/Mangin elements along the optical path, and placing all elements along a single

axis would not work for its intended purpose, nor produce any type of reasonable image. Similarly, simply placing an immersion substance in front of or somehow in cooperation with the Shafer 722 design would not operate in accordance with the intended purpose, namely imaging specimens. The images received would be less than optimal unless extensive experimentation occurred or alternately the present design were available and employed. Further, the specific configuration presented serves, as noted in the specification, to balance aberrations and reduce decenter sensitivity, aspects not achievable using Shafer 722 in combination with an immersion substance without a complete redesign after excessive experimentation.

Regarding the combination of Shafer 722 and Yonekubo, the January 26 Office Action makes general arguments about what the Shafer 722 and Yonekubo references teach, which are then implicitly applied to the independent claims. However, the Office Action fails to make a prima facie case for obviousness because there is no adequate teaching, suggestion, or motivation to combine these references either explicitly or implicitly in the references themselves or in the general state of the art.

The standard for making an obviousness rejection is currently set forth in MPEP 706.02(j):

> To establish a *prima facie* case of obviousness, *<u>three basic criteria must be met</u>*. **<u>First</u>**, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. **<u>Second</u>**, there must be a reasonable expectation of success. **<u>Finally</u>**, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The ***teaching or suggestion*** to make the claimed combination **and** the ***reasonable expectation of success*** **must** ***both be found in the prior art,*** **and not** ***based on applicant's disclosure***. (emphasis and formatting added) MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)
>
> The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed

> invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a ***convincing line of reasoning*** as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). (emphasis added).

See also, KSR International Co. v. Teleflex Inc., No. 04-1350, 550 U.S. ___ (2007).

The Office Action fails to meet this burden. Although the Office Action tries to describe how one skilled in the art would have been motivated to modify the Shafer 722 objective to include the immersion substance of Yonekubo and make a functional or useful objective, these attempts have fallen short.

For example, the Januray 26 Office Action states:

> It would have been obvious to one of ordinary skill in the art...to use a well known immersion substance with the objective of Shafer [722] as taught by Yonekubo to provide better imaging performance.

(Office Action, p. 4).

Appellants make two points here. First, this Office Action passage advocates wholesale use of an immersion substance with the Shafer 722 design, purportedly for the purpose of providing "better imaging performance." Aside from the fact that such a combination would not provide a useful objective for the stated purpose of imaging a specimen, such a combination would not yield the single axis orientation, aberration balancing, or decenter sensitivity configurations claimed as discussed above. Second, this is not a reason to combine references – this is an end result gleaned from Appellants' claims, put forward to support a combination that has no suggestion or support in the references themselves. It is disingenuous and overly simplistic to say that "better imaging performance" is desirable – better performance is always desirable. The question is what *reasoning* supports combining the references to produce the invention claimed, and "improving performance" is not reasoning supporting such a combination. This reasoning is tantamount to saying one would be motivated to combine A with B because then you could have A and B, which is better than just A. This is not a reason to

combine, but a desired end result gleaned from Appellants' claims and the use of hindsight.

Shafer 722 is a broad band DUV/VUV imaging system that does not employ an immersion substance, does not discuss an immersion substance, and does not illustrate an embodiment having a mangin mirror arrangement wherein light energy enters through a back or rear side and is provided to a specimen. Instead, Shafer 722 uses a mangin mirror element to provide substantially what may be termed a retro beam reflecting light energy back from the light energy received (see, e.g., FIG. 3). One critical issue is therefore the complete absence of an immersion substance from the Shafer 722 reference.

Yonekubo does not disclose nor suggest the unique properties associated with the present design, including but not limited to elements configured to balance aberrations to reduce decenter sensitivity, providing light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range and focusing the light energy using at least one lens into focused light energy, where each lens used in said focusing has diameter less than approximately 100 millimeters. Yonekubo shows immersion substances used in microscopes, but does not indicate use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range, use focusing lenses and field lenses as claimed, or disclose or suggest at least one Mangin mirror element having diameter less than 100 millimeters receiving light energy. It is as if an immersion substance was found in a random reference and assumed to be insertable wholesale into the Shafer 722 device. However, one could not simply place an immersion substance within the Shafer 722 design and obtain an objective design having the beneficial aspects presently claimed or operating with any level of adequate performance. In other words, the resultant device would yield a poor image and provide inadequate inspection capabilities in the environment claimed. Thus it is difficult, if not impossible, to argue that one would reasonably combine the design of Shafer 722 with the immersion substances of Yonekubo based on the disclosure of the references themselves.

As noted above, the PTO has the burden of establishing a prima facie case of obviousness under 35 USC §103. The Patent Office must show that some reason to combine the elements with some rational underpinning that would lead an individual of ordinary skill in the art to combine the relevant teachings of the references. *KSR International Co. v. Teleflex Inc.*, No. 04-1350, 127 S. Ct. 1727 (2007); *In re Fine*, 837 F.2d 1071, 1074 (Fed. Cir. 1988). Therefore, a combination of relevant teachings alone is insufficient grounds to establish obviousness, absent some reason for one of ordinary skill in the art to do so. *Fine* at 1075. In this case, the Examiner has not pointed to any cogent, supportable reason that would lead an artisan of ordinary skill in the art to come up with the claimed invention.

None of the references, alone or in combination, teaches the unique features called for in the claims. It is impermissible hindsight reasoning to pick a feature here and there from among the references to construct a hypothetical combination which obviates the claims.

> It is impermissible, however, simply to engage in a hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps. [*citation omitted*]

In re Gordon, 18 USPQ.2d 1885, 1888 (Fed. Cir. 1991).

A large number of devices may exist in the prior art where, if the prior art be disregarded as to its content, purpose, mode of operation and general context, the several elements claimed by the applicant, if taken individually, may be disclosed. However, the important thing to recognize is that the reason for combining these elements in any way to meet Appellant's claims only becomes obvious, if at all, when considered from hindsight in the light of the application disclosure. The Federal Circuit has stressed that the "decisionmaker must step backward in time and into the shoes worn by a person having ordinary skill in the art when the invention was unknown and just before it was made." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1566 (Fed. Cir. 1987). To

do otherwise would be to apply hindsight reconstruction, which has been strongly discouraged by the Federal Circuit. *Id.* at 1568.

> To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

W.L. Gore & Assoc. v. Garlock, Inc., 721 F.2d 1540, 1553 (Fed. Cir. 1983). Therefore, without some reason in the references to combine the cited prior art teachings, with some rational underpinnings for such a reason, the Examiner's conclusory statements in support of the alleged combination fail to establish a prima facie case for obviousness. *See, KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007) (obviousness determination requires looking at "whether there was an apparent reason to combine the known elements in the fashion claimed...", *citing In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness," KSR at 14).

Simply stating that the invention would have been obvious to a person of ordinary skill is also insufficient, for the assertion must be supported by clear and convincing evidence. *Panduit*, *supra*, 810 F.2d at 1568. The Office Action merely states that the invention would be obvious in light of the proposed combination, and does not provide clear and convincing evidence or reasoning to support this assertion.

The Examiner has failed to avoid the effects of hindsight reasoning in fashioning the combination of Shafer 722 and Yonekubo, presents no reasons having rational underpinnings in support of the combination, and for these further reasons independent claims 43, 55, 65, 78, and 90 are allowable. Claims depending from claims 43, 55, 65, 78, and 90, including the claims 52, 75, and 87 rejected based on these references in combination with Deutsch, are also allowable as they include limitations not shown in the cited references, either alone or in combination.

Accordingly, it is respectfully submitted that all pending claims fully comply with 35 U.S.C. § 103.

CONCLUSION

In view of the foregoing, Appellants submit that all pending claims are patentably distinct over the prior art and are allowable. Thus the Final Office Action rejecting all pending claims is in error and should be reversed.

Appellants believe that no fees are due in accordance with this Appeal Brief beyond those included herewith. Should any additional fees be due or overpayment made, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment to Deposit Account 502026.

Respectfully submitted,

Date: July 25, 2007

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8. CLAIMS APPENDIX

1 through 42. (cancelled)

43. An objective for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range, comprising:

at least one focusing lens having diameter less than approximately 100 millimeters receiving said light energy and transmitting focused light energy;

at least one field lens having diameter less than approximately 100 millimeters, receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy and providing controlled light energy through an immersion substance to a specimen;

wherein each focusing lens and each field lens is formed from a single glass material and aligned substantially along an axis, and further wherein said Mangin mirror element, said at least one focusing lens, and said at least one field lens are configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens, and said at least one field lens.

44. The objective of claim 43, wherein said objective has a field size of approximately 0.15mm.

45. The objective of claim 43, configured to have a numerical aperture of approximately 1.2.

46. The objective of claim 43, wherein each lens used in the objective has a diameter of less than approximately 25 millimeters.

47. The objective of claim 43, said objective used with a microscope having a flange, wherein the flange may be located at least approximately 45 millimeters from the specimen during normal operation.

48. The objective of claim 47, wherein the flange may be located at least approximately 100 millimeters from the specimen during normal operation.

49. The objective of claim 43, further comprising at least one additional lens constructed from a second glass material.

50. The objective of claim 43, wherein the immersion substance is water.

51. The objective of claim 43, wherein the immersion substance is oil.

52. The objective of claim 43, wherein the immersion substance is silicone gel.

53. The objective of claim 43, wherein the objective is optimized to produce minimum spherical aberration, axial color, and chromatic variation of aberrations.

54. The objective of claim 43, wherein the at least one mangin mirror element is optimized to produce spherical, axial color, and chromatic variation of aberrations to compensate for aberrations induced by the focusing lens group.

55. An objective comprising:

at least one focusing lens having diameter less than approximately 100 millimeters receiving said light energy and transmitting focused light energy;

at least one field lens having diameter less than approximately 100 millimeters, receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy through said Mangin mirror element and providing controlled light energy through an immersion substance to a specimen;

wherein said objective is configured to provide broadband imaging while receiving light energy at wavelengths less than 400 nm and further wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis and configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens and said at least one field lens.

56. The objective of claim 55, wherein said objective has a field size of approximately 0.15mm.

57. The objective of claim 55, wherein said at least one Mangin mirror element comprises:

a single lens/mirror element comprising:

a substantially curved concave surface; and

a second minimally curved surface;

wherein both surfaces of the single lens/mirror element are reflective with small central apertures through which light energy may pass.

58. The objective of claim 55, said objective having a numerical aperture of greater than approximately 1.0 at the specimen.

59. The objective of claim 55, wherein each lens in the objective has a diameter of less than approximately 25 millimeters.

60. The objective of claim 55, said objective having an ability to be employed with a microscope having a flange, wherein the flange may be located less than no more than approximately 45 millimeters from the specimen during normal operation.

61. The objective of claim 55, wherein the lenses of the objective are constructed of no more than two glass materials.

62. The objective of claim 61, wherein the no more than two glass materials comprise fused silica and calcium fluoride.

63. The objective of claim 55, wherein the immersion substance comprises one from a group comprising water, oil, and silicone gel.

64. The objective of claim 55, configured to have a numerical aperture of approximately 1.2.

65. A method for inspecting a specimen, comprising:

providing light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range;

focusing said light energy using at least one lens into focused light energy, where each lens used in said focusing has diameter less than approximately 100 millimeters;

receiving said focused light energy and converting said focused light energy into intermediate light energy; and

receiving said intermediate light energy through an optical element and providing controlled light energy from the optical element and through an immersion substance to a specimen;

wherein said optical element is configured to operate with said focusing light energy and receiving focused light energy to balance aberrations resulting from the focusing, receiving focused light energy, converting, receiving intermediate light energy, and providing controlled light energy.

66. The method of claim 65, wherein said method results in a field size of approximately 0.15mm.

67. The method of claim 66, wherein said providing, focusing, focused light energy receiving, and intermediate light energy receiving results in a field size of approximately 0.15mm.

68. The method of claim 66, providing, focusing, focused light energy receiving, and intermediate light energy receiving results in a numerical aperture of approximately 1.2.

69. The method of claim 66, wherein each lens used has a diameter of less than approximately 25 millimeters.

70. The method of claim 66, said method employed with a microscope having a flange, wherein the flange may be located at least approximately 45 millimeters from the specimen during normal operation.

71. The method of claim 70, wherein the flange may be located at least approximately 100 millimeters from the specimen during normal operation.

72. The method of claim 66, wherein only two glass materials are used for lenses.

73. The method of claim 66, wherein the immersion substance is water.

74. The method of claim 66, wherein the immersion substance is oil.

75. The method of claim 66, wherein the immersion substance is silicone gel.

76. The method of claim 66, wherein providing, focusing, focused light energy receiving, and intermediate light energy receiving is optimized to produce minimum spherical aberration, axial color, and chromatic variation of aberrations.

77. The method of claim 66, wherein the providing, focusing, focused light energy receiving, and intermediate light energy receiving is optimized to produce

spherical, axial color, and chromatic variation of aberrations to compensate for aberrations induced.

78. An objective for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range, comprising:

at least one focusing lens receiving said light energy and transmitting focused light energy;

at least one field lens receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy and providing controlled light energy through an immersion substance to a specimen;

wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis and configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens and said at least one field lens.

79. The objective of claim 78, wherein said objective has a field size of approximately 0.15mm.

80. The objective of claim 78, configured to have a numerical aperture of approximately 1.2.

81. The objective of claim 78, wherein each lens used in the objective has a diameter of less than approximately 25 millimeters.

82. The objective of claim 78, said objective used with a microscope having a flange, wherein the flange may be located at least approximately 45 millimeters from the specimen during normal operation.

83. The objective of claim 82, wherein the flange may be located at least approximately 100 millimeters from the specimen during normal operation.

84. The objective of claim 78, wherein only two glass materials are used.

85. The objective of claim 78, wherein the immersion substance is water.

86. The objective of claim 78, wherein the immersion substance is oil.

87. The objective of claim 78, wherein the immersion substance is silicone gel.

88. The objective of claim 78, wherein the objective is optimized to produce minimum spherical aberration, axial color, and chromatic variation of aberrations.

89. The objective of claim 78, wherein the at least one mangin mirror element is optimized to produce spherical, axial color, and chromatic variation of aberrations to compensate for aberrations induced by the focusing lens group.

90. An objective for use with light energy having a wavelength in the range of approximately 157 nanometers through the infrared light range, comprising:

at least one focusing lens receiving said light energy and transmitting focused light energy;

at least one field lens receiving said focused light energy and transmitting intermediate light energy; and

at least one Mangin mirror element having diameter less than 100 millimeters receiving said intermediate light energy and providing controlled light energy through an immersion substance to a specimen

wherein said Mangin mirror element, said at least one focusing lens and said at least one field lens are substantially aligned along a single axis and configured to balance aberrations therebetween, said aberration balancing reducing decenter sensitivity of the Mangin mirror element, said at least one focusing lens and said at least one field lens.

91. The objective of claim 90, wherein said objective has a field size of approximately 0.15mm.

92. The objective of claim 90, wherein said at least one Mangin mirror element comprises:

a single lens/mirror element comprising:

a substantially curved concave surface; and

a second minimally curved surface;

wherein both surfaces of the single lens/mirror element are reflective with small central apertures through which light energy may pass.

93. The objective of claim 90, said objective having a numerical aperture of greater than approximately 1.0 at the specimen.

94. The objective of claim 90, wherein each lens in the objective has a diameter of less than approximately 25 millimeters.

95. The objective of claim 90, said objective having an ability to be employed with a microscope having a flange, wherein the flange may be located less than no more than approximately 45 millimeters from the specimen during normal operation.

96. The objective of claim 90, said objective employing no more than two glass materials.

97. The objective of claim 96, wherein the no more than two glass materials comprise fused silica and calcium fluoride.

98. The objective of claim 90, wherein the immersion substance comprises one from a group comprising water, oil, and silicone gel.

99. The objective of claim 90, configured to have a numerical aperture of approximately 1.2.

9. EVIDENCE APPENDIX

None.

10. RELATED PROCEEDINGS APPENDIX

None.

PATENT
Atty Docket No. KLAC0076

I HEREBY CERTIFY THAT ON JULY 25, 2007, THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO: MAIL STOP APPEAL BRIEF - PATENTS, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450.

STEVEN W. SMYRSKI

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Group Art Unit: 2872
DAVID R. SHAFER, ET AL.	Examiner: Joshua L. Pritchett
Title: CATADIOPTRIC IMAGING SYSTEM FOR BROAD BAND MICROSCOPY	
Serial No.: 10/646,073	
Filed: August 22, 2003	

PETITION FOR ONE MONTH EXTENSION OF TIME

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with Rule 136, Applicants respectfully petition the Commissioner for a one month extension of time to July 1, 2007, the period for filing an Appeal Brief pursuant to the Notice of Appeal mailed by Applicants and received by the Patent Office on May 1,

2007. A PTO-2038 form authorizing a charge for $120.00 and the Appeal Brief papers are included herewith.

Applicants believe that no fees are due in accordance with this Petition beyond those included herewith. Should any additional fees be due, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment to Deposit Account No. 502026.

Respectfully submitted,

Date: July 25, 2007

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